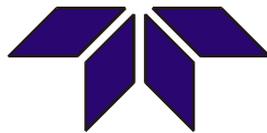# *SNACK O$_2$* Analyzer

**Oxygen Gas Analyzer Owners Manual**

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## Introduction

Congratulations on the purchase of a **SNACK O₂** gas analyzer. We are confident that you will find this gas analyzer to be accurate, reliable and easy to use. Designed for portability, this analyzer is well suited for a number of applications and in all sorts of environments. Please take a moment to browse through this manual and to familiarize yourself with the various features and functions of the analyzer.

## Specifications

| | |
|---|---|
| Operating Temperature: | $32° – 122° (0° – 50° C)$ |
| Operating Humidity: | 5 – 95% RH, Non-condensing |
| Response Time: | 90% of reading < 3 sec. |
| Warm-up Time: | None. |
| Calibration: | $O_2$ - Atmosphere (20.9% $O_2$). |
| *Battery Life: | 1 hour continuous sample |
| Power Requirements: | 12 VDC (500 mA) external power. |
| Weight: | 48 oz. |

\* approximation

### *Oxygen (O₂) sensor*

| | |
|---|---|
| Range: | $0 – 100\% \ O_2$ |
| Accuracy:* | +/- 1% reading full scale |
| Repeatability: | Better than 0.1% $O_2$ |

## Battery Life Notes

The analyzer has been designed to minimize power consumption. Factors such as ambient temperature and device usage have an effect on battery performance. For optimal battery life, follow these tips:

- Place the Power switch in the OFF position whenever analyzer is not being used for any long period of time.

- Utilize external power source whenever possible.

- In **Batt**. position, turn off the LCD Back Light when not needed.

- Set the Sleep Mode Timeout to a usable minimum.

- Never store the analyzer over long periods of time with dead batteries. To do so may cause damage and shorten battery life.

- Do not store the analyzer over long periods of time with the external power source plugged in.

## Functions

The analyzer has two modes of operation, the Program Mode and the Operate Mode.

### Power Switch

| Switch Position | Description |
|---|---|
| OFF | Analyzer power is off. Batteries will continue to charge if Power Supply is connected. |
| Batt. | Battery Power – Analyzer is on and drawing power from the internal batteries. Batteries will continue to charge if Power Supply is connected. |
| Ext. | External Power – Analyzer is on and is drawing power from either the external battery or the external power supply. If the external power supply is connected, then the Batteries (both internal and external) will continue to charge while switch is in this position. Analyzer will not operate in this switch position if the Power Supply or external battery is not connected. |

### Operate Mode

The Operate Mode is the default mode of operation when the Power Switch is placed in the on (Batt. or Ext.) position. $O_2$ is displayed in the LCD and the sample button is available to operate the pump and draw samples.

**LCD Display**

| Displayed | Description |
|---|---|
| $O_2$      *XX.X(X)* | Oxygen Reading (%) |
| $O_2$-      *XX.XX* | (-) Indicates the sample pump is running. |
| ● ● ● ● | Indicates that the analyzer is in the battery saving sleep mode. Cycle the power switch to return the analyzer to the Operate Mode. |
| Low Batt | Indicates that the internal batteries are low on power and need to be charged. |
| RE-CAL? | Indicates that the internal processor has reset and parameter values have been reset to the default setting. |

**Buttons Functions (Operate Mode)**

| BUTTON | FUNCTION |
|--------|----------|
| MENU | Places the analyzer into the Program Mode. |
| ON (Light) | Turns on the display Back Light. |
| OFF (Light) | Turns off the display Back Light. |
| SAMPLE | Turns on and off the sample pump. |

*Program Mode*

The Program Mode allows the user to view and change the parameter values (i.e. Sample duration, Sleep timer, etc.).  The user may enter the Program Mode by pressing the MENU button.  Repeatedly press the MENU button to cycle through the parameter menu.  Pressing the SAVE button will save all changed parameter values and returns the analyzer back to the Operate Mode.

**Buttons Functions (Program Mode)**

| BUTTON | FUNCTION |
|--------|----------|
| MENU | Places the analyzer in the Program Mode and cycles through the parameter menu. |
| SAVE | Saves all changed parameter values and returns the analyzer to the Operate Mode. |
| Arrow Up (↑) | Adjusts parameter values up. |
| Arrow Down (↓) | Adjusts parameter values down. |
| YES / NO | Answers yes / no questions. |

**Parameter Menu**

| Displayed | Description |
|-----------|-------------|
| $O_2$       CAL? | Calibrate oxygen sensor? Press the YES/NO button to display the calibration value. |
| $O_2$       *XX.XX* | Oxygen calibration value (%) – Use the arrow buttons to adjust |

| | | |
|---|---|---|
| | | the value. |
| Samp. | *XX* | Sample duration – Pump will run for xx number of seconds then stop. Adjust using the arrow buttons.<br><br>01 – 99 seconds<br><br>00 = No timed duration |
| Sleep | *XX* | Sleep mode timeout – Analyzer will go into battery saving sleep mode after xx number of minutes. Adjust using the arrow buttons.<br><br>01 – 99 minutes<br><br>00 = No timeout |
| Hold | *on/off* | Auto Reading Hold – Indicates if the auto hold function is ON or OFF. Use the arrow buttons to toggle between on and off. |

# Operation

## *Drawing A Sample*

The following is a general procedure check list to start and use the gas analyzer.

1. Place the POWER switch in either the **Batt**. or **Ext**. position.  The LCD will display O2. (Note:  the $O_2$ reading will not display until the SAMPLE button has been pressed.)

2. Connect the sample line to the Sample Connector located at the top of the analyzer.  Ensure that there is an inline filter in the sample line*.  Failure to use the inline filter may cause damage to the sensor and sample pump.*

3. Place or connect the end of the sample line to the space to be sampled.

   A) M.A.P. – Insert the sample needle into the package's head space.  <u>Avoid placing the needle into product or fluid</u>.

4. Press the SAMPLE button.  The sample pump will draw in a gas sample and the current $O_2$ reading will be displayed.  The pump will continue to run until the Sample Duration times out or until the SAMPLE button is pressed again.

   If the Auto Hold function is on, then the $O_2$ displayed value will lock when the pump stops.

   **Note:** The duration of sample time will vary from one application to another.  In general, the longer you draw in a sample, the more accurate the gas analysis will be.  Adjustments of the Sample Duration timer will be needed to find the right amount of sample time for your specific application.

5. Press the Light ON button to turn on the LCD Back Light.

## *Sample Duration*

The Sample Duration timer allows you to set the number of seconds the pump will run and draw in a sample after the SAMPLE button is pressed.  The sample pump may be stopped at any time by pressing the SAMPLE button.  This timer can be adjusted in the parameter menu.

Placing the Sample Duration timer to zero (0) seconds sets the pump to a manual mode.  Press the SAMPLE button to start the pump.  The pump will continue to run until the SAMPLE button is pressed again.

## *Sleep Mode Timeout*

The Sleep Mode Timeout allows you to set the number of minutes the analyzer will wait without any button activity before going into the battery saving sleep mode. This timer can be adjusted in the parameter menu.

In the sleep mode, the analyzer will shut down the sensors and most of the processor functions in order to conserve battery power. The sleep mode is indicated by four dots (● ● ● ●) along the bottom of the display.

To return the analyzer to the Operate Mode, cycle the Power switch off and then on.

### Auto Hold Function

The Auto Hold function allows the user to have the oxygen value hold in the display when the sample pump turns off. This function can be turned on or off in the parameter menu.

### Battery Level Indicator

The level of battery power can be indicated by pressing the upper left hand corner of the analyzer display decal (just above the MENU button). Four chevrons (<<<<) indicate full battery charge. As the battery charge weakens, the number of displayed chevrons will decrease.

### Battery Charging

Both the internal and external batteries may be charged by plugging the Power Supply/Charger into the POWER SUPPLY receptacle located at the bottom of the analyzer.

### Filter

In order to prevent damage to the sensors or sample pump it is necessary to use the inline filter every time you are drawing a sample. The filter should be checked periodically and replaced if there are any signs dirt or discoloration in the filter.

The analyzer has a secondary, internal filter. Typically this filter will never need to be changed.

### Oxygen Resolution Adjustment

The oxygen resolution adjustment is not functional with the *SNACK O$_2$* gas analyzer. Jumper J1 should remain open.

### Sensor Life Indicator

The estimated remaining sensor life can be displayed by pressing the upper right hand corner of the analyzer display decal (just above the arrow-up button). Four chevrons (<<<<) indicate that the oxygen sensor is good. As the oxygen sensor

depletes over time, the number of displayed chevrons will decrease.  It is recommended that the sensor is replaced when two or fewer chevrons are displayed.

## Calibration

### *Oxygen Sensor (O₂)*

Electrochemical sensors degrade slowly over time.  For optimal performance and to ensure accuracy, it is recommended that the oxygen sensor be span calibrated daily using normal outside atmosphere air (20.9% $O_2$).  Use the following steps to calibrate the oxygen sensor.

1.  Turn on the analyzer and allow it to warm up for at least one (1) minute.  Ensure the Sleep Mode Timeout is set greater than one minute.
2.  Press the SAMPLE button to turn on the sample pump.  Allow the pump to draw in outside atmosphere air (20.9% $O_2$) for thirty (30) seconds or until the oxygen reading has stabilized.
3.  If oxygen reading is greater than +/- 0.3% of the sampled air, then CAL adjust is recommended.  Press the MENU button to enter the Program Mode.  The LCD will display: **$O_2$   CAL?.**
4.  Press the YES/NO button.  The LCD will display: **$O_2$   *XX.XX*.**  Press the arrow buttons to adjust the O2 value to read **20.90**.
5.  Press the SAVE button to save the calibration value and to exit the Program Mode.

## Maintenance and Adjustments

### *Opening / Closing The Analyzer Case*

From time to time it will be necessary to open the analyzer case to perform maintenance and/or replace the oxygen sensor.  The following procedure is a step by step guide to opening the analyzer.  Read through the entire procedure before attempting to open the analyzer case.

Keep in mind that the top half of the case is connected to the bottom half by a non-detachable ribbon cable.  Great care should be taken when handling the opened analyzer.

1.  **To open the analyzer**, place the Power switch to the OFF position and place the analyzer face-down on a padded, flat surface.
2.  Using a phillips screwdriver, completely remove the six (6) screws from the back of the analyzer.

3. Gripping the entire analyzer, carefully turn over the analyzer and place it face-up on the flat surface.

4. Carefully remove the top half of the analyzer and place it face-down and to the right of the bottom half.

5. **To close the analyzer**, carefully place the top half of the analyzer on top of the bottom half.  Ensure that all tubing and wiring is tucked inside the case.  Ensure that the seal gasket is in place.  Check for secure fit of the two halves.

6. Gripping the entire analyzer, carefully turn over the analyzer and place it face-down on the flat surface.

7. Replace all six (6) screws into the back of the analyzer and tighten snug with a phillips screwdriver.


### *Replacing the Oxygen sensor*

Typically the oxygen sensor needs to be replaced every eight (8) to ten (10) months.  The following procedure is a step by step guide to replacing the oxygen sensor.  Refer to Figure "**A**", Sensor Installation/Replacement Procedure for more detailed information.


1. Open the analyzer (see Opening / Closing the Analyzer).

2. Carefully pull the oxygen sensor straight up out of the case.

3. Disconnect the ribbon cable from the top of the sensor by lightly spreading open the two side ejector locks.

4. Gently pull the blue input tube off of the center sensor barb.  Next, unscrew the barb lock fitting off of the sensor sample exhaust output.

5. Discard used sensor.

6. Reconnect the ribbon cable to the top of the new sensor by gently pushing the cable plug into the sensor socket until the two side ejector locks close.

7. Reconnect the blue sample tube to the center sensor barb and reconnect the sample exhaust tube to the barb lock fitting.

8. Carefully place the oxygen sensor back down into the case.  Make sure that the sensor is pushed down towards the bottom of the case to prevent the sensor from interfering with the top circuit board.

9. Close the analyzer (see Opening / Closing the Analyzer) and calibrate (see Oxygen Calibration).

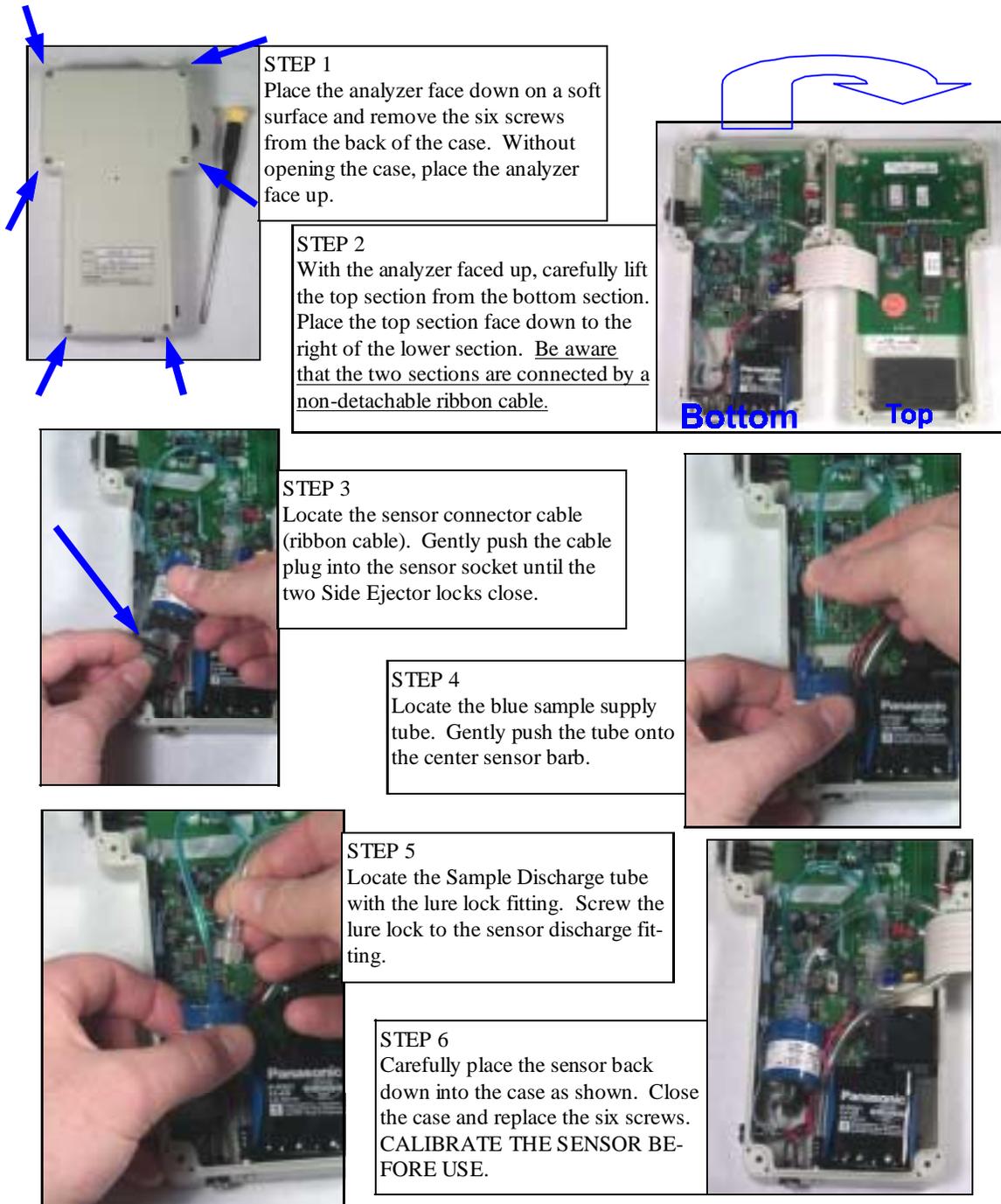# Sensor Installation/Replacement Procedure for the SNACK O2 Analyzer



STEP 1
Place the analyzer face down on a soft surface and remove the six screws from the back of the case. Without opening the case, place the analyzer face up.

STEP 2
With the analyzer faced up, carefully lift the top section from the bottom section. Place the top section face down to the right of the lower section. Be aware that the two sections are connected by a non-detachable ribbon cable.

STEP 3
Locate the sensor connector cable (ribbon cable). Gently push the cable plug into the sensor socket until the two Side Ejector locks close.

STEP 4
Locate the blue sample supply tube. Gently push the tube onto the center sensor barb.

STEP 5
Locate the Sample Discharge tube with the lure lock fitting. Screw the lure lock to the sensor discharge fitting.

STEP 6
Carefully place the sensor back down into the case as shown. Close the case and replace the six screws. CALIBRATE THE SENSOR BEFORE USE.

*Figure A*

### Battery Replacement

Over time the performance of the internal batteries may degrade and replacement of the batteries may become necessary. Read **Battery Life Notes** at the beginning of this manual to ensure optimal battery performance. Contact your analyzer distributor or Teledyne Analytical Instruments to purchase replacement batteries.

1. To replace the internal batteries, place the Power switch to the OFF position. Disconnect any external power supply.

2. Open the analyzer case (see Opening / Closing the Analyzer).

3. Carefully lift the two batteries up and out of the case. Disconnect the two batteries from the controller board by pulling the each battery connector straight up.

4. The battery connectors are polarized and can only plug into the receptacles in one direction. Plug in the new batteries and carefully place them into the case with one stacked on top of the other..

5. Close the analyzer case (see Opening / Closing the Analyzer) and charge the new batteries for at least six (6) hours before using analyzer.

## Troubleshooting

| Problem | Solutions |
|---|---|
| No display. | • Check the position of the Power switch.<br>• Check battery life. |
| Pump is very slow or will not run. | • Check battery life<br>• Check for clogged or blocked sample line.<br>• Check for clogged or blocked needle.<br>• Check for dirty filter.<br>• Check for clogged hose inside analyzer and internal filter.<br>• Adjust pump speed. |
| Unstable sensor reading. | • Check for clogged or blocked sample line.<br>• Ensure Sample exhaust port is not blocked. |
| Sample pump stops immediately after starting it. | • Increase Sample Duration time in the Parameter Menu.<br>• Check for dirty filter or blocked sample line. |

| | |
|---|---|
| Analyzer does not function in the Ext. Power switch position. | • Ensure the power supply is plugged into the External Power receptacle or the external battery is plugged into the External Battery receptacle.<br><br>• Ensure there is power to power supply. |
| Batteries do not charge. | • Ensure the power supply is plugged into the External Power receptacle. |
| Batteries do not hold a charge for more than a few minutes. | • Replace batteries. |
| $O_2$ reading appears to be incorrect. | • Recalibrate the sensor.<br><br>• Sensor may need to be replaced. |
| $O_2$ reading does not appear on the display in the Program Menu. | • Cycle the SAMPLE pump on and then off then return to the Program Menu. |

## Technical Support / Accessories

For technical assistance, please contact Teledyne Analytical Instruments.

### Accessories & Recommended Spare Parts

• Carrying Case w/ shoulder strap

• External Battery Pack (includes carrying case)

• Oxygen Sensor (UFO-130)

• Replacement Filters

• Side Draw Needles

• Sample Probe Kit (needle, filter, tubing, and connector)

• Replacement Batteries

• Septum

# Warranty

**Covered and Duration of Warranty**
Manufacturer warrants that the Products you have purchased from Manufacturer or from a Manufacturer authorized reseller is free from defects in material and workmanship for a period of one (1) year from the date of purchase. Your sales receipt, showing the date of purchase is your proof of the date of purchase. This warranty extends only to you, the original Purchaser and is not transferable to anyone who subsequently purchases the Products from you.

**Terms of Warranty**
If the Products do not conform to this Limited Warranty during the warranty period (as herein above specified), Purchaser shall notify Manufacturer or authorized reseller of the claimed defects and demonstrate to Manufacturer the said defects. If the defects are properly reported to Manufacturer within the warranty period, Manufacturer shall repair or, at Manufacturer's option, replace defective Products with a new or used functional unit that is equivalent or superior in performance to the original Products. All exchanged parts and Products replaced under this warranty will become property of the Manufacturer.

**Limitations of Warranty**
THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. Manufacturer does not warrant against damages or defects as a result of accident, abuse, or improper use, handling or operation of the Products; (b) as a result of an act of God; (c) by the use of parts not manufactured or sold by Manufacturer; (d) by modifications of the unit; or (e) as a result of service by anyone other than the Manufacturer. This warranty excludes items considered expendable or consumable(i.e. filters, depletable sensors)

EXCEPT AS EXPRESSLY SET FORTH IN THIS WARRANTY, MANUFACTURER MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. MANUFACTURER EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED IN THIS LIMITED WARRANTY. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW ARE LIMITED TO THE TERMS OF THIS EXPRESS LIMITED WARRANTY.

THIS WARRANTY IS EXCLUSIVE. The sole and exclusive obligation of Manufacturer shall be to repair or replace the defective Products in the manner and for the period provided above. Manufacturer shall not have any other obligation with respect to the Products or any part thereof, whether based on contract, tort, strict liability or otherwise. Under no circumstances, whether based on this Limited Warranty or otherwise, shall Manufacturer be liable for lost profits, lost savings, incidental, special, or consequential damages. Manufacturer is not liable for any claim made by a third party or made by you for a third party.

Manufacturer's employees or representatives' ORAL OR OTHER WRITTEN STATEMENTS DO NOT CONSTITUTE WARRANTIES, shall not be relied upon by Purchaser, and are not a part of this limited warranty.
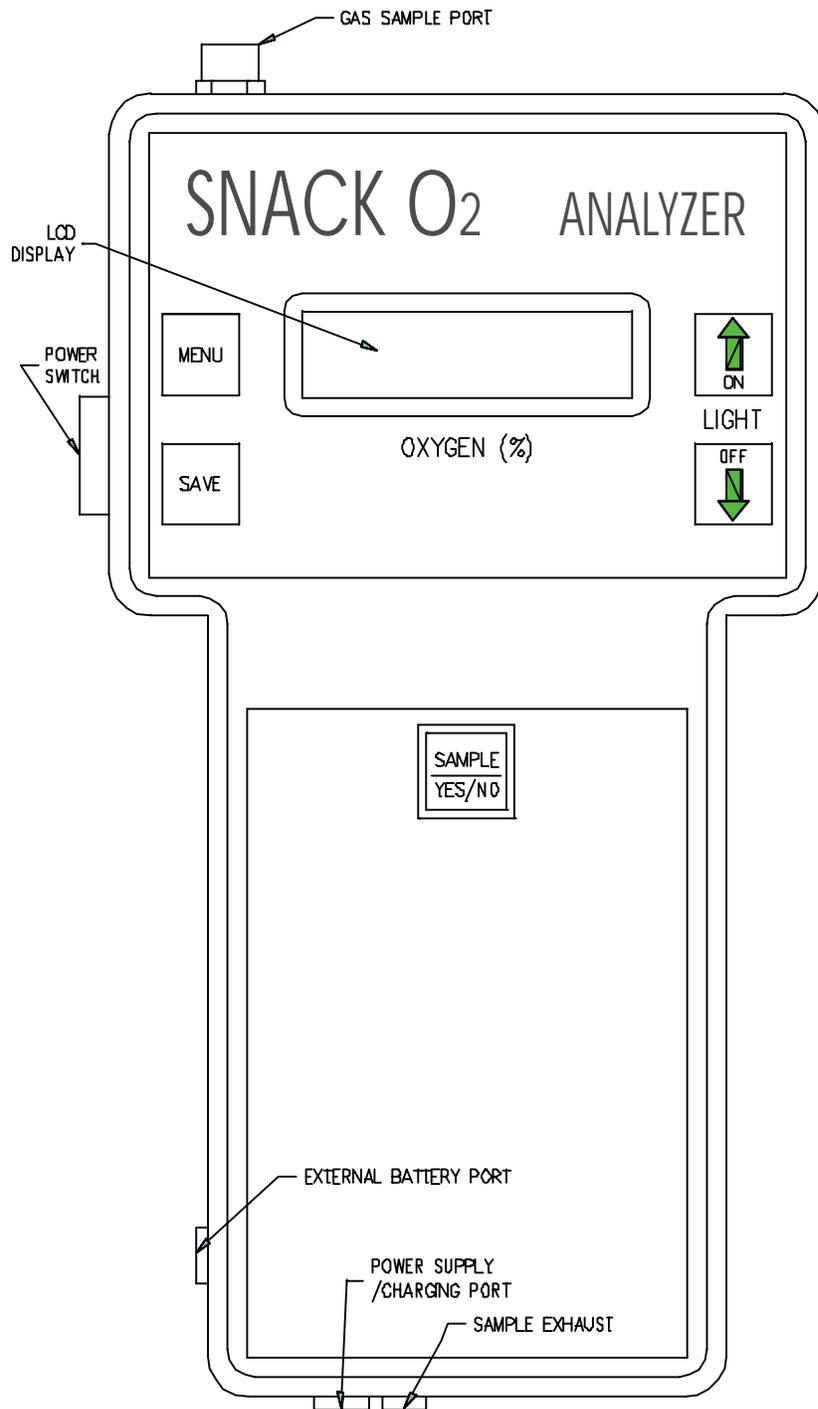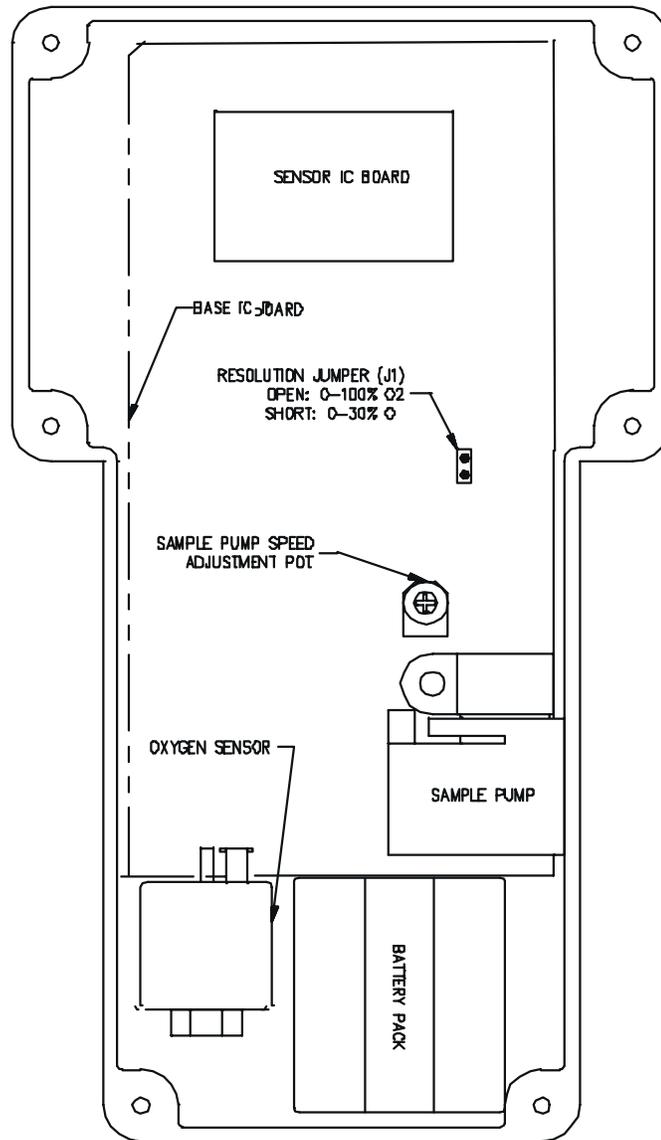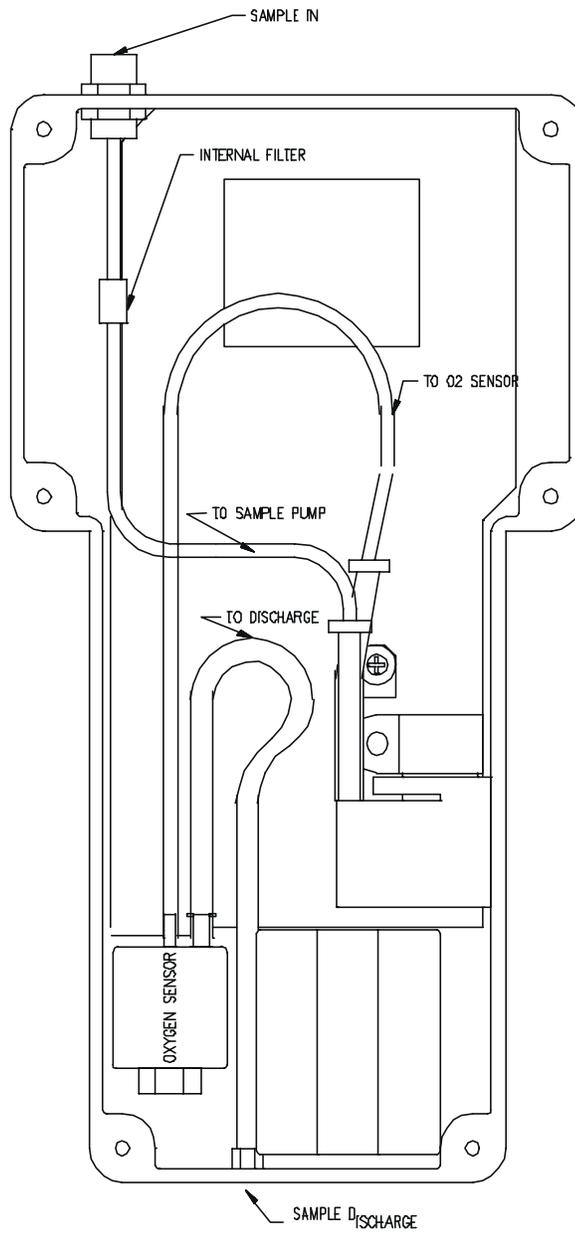
# Figures



*Figure 1*

**Figure 2**

**Figure 3**